Terawave
COMMUNICATIONS

Full Service Network Access (FSAN)
Passive Optical Networks (PON)

An Integrated Approach to Range Communications

Introduction

Standards in the network

- ✓ **SONET**
- ✓ **ATM**
- ✓ **PON**

Integrated Solution Delivers

- ✓ **Tailored Solution for Range Community**
- ✓ **Converged Services support for all range needs**
- ✓ **Reliability/ low latency/ Fully redundant**
- ✓ **Centralized Management**
- ✓ **Encryption and Inter- range circuit support**

Benefits

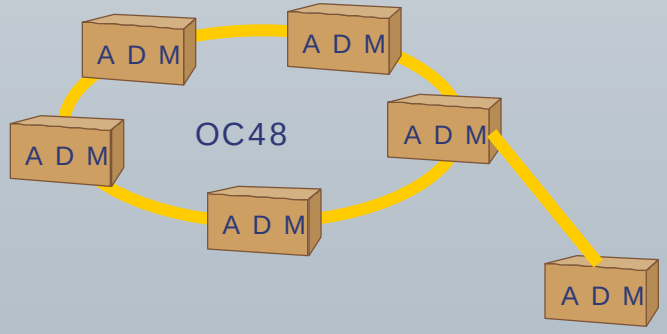
- ✓ **Low Initial Cost and low incremental cost**
- ✓ **Low operational Cost**
- ✓ **Reduced error rate and simplified operations for mission churn**

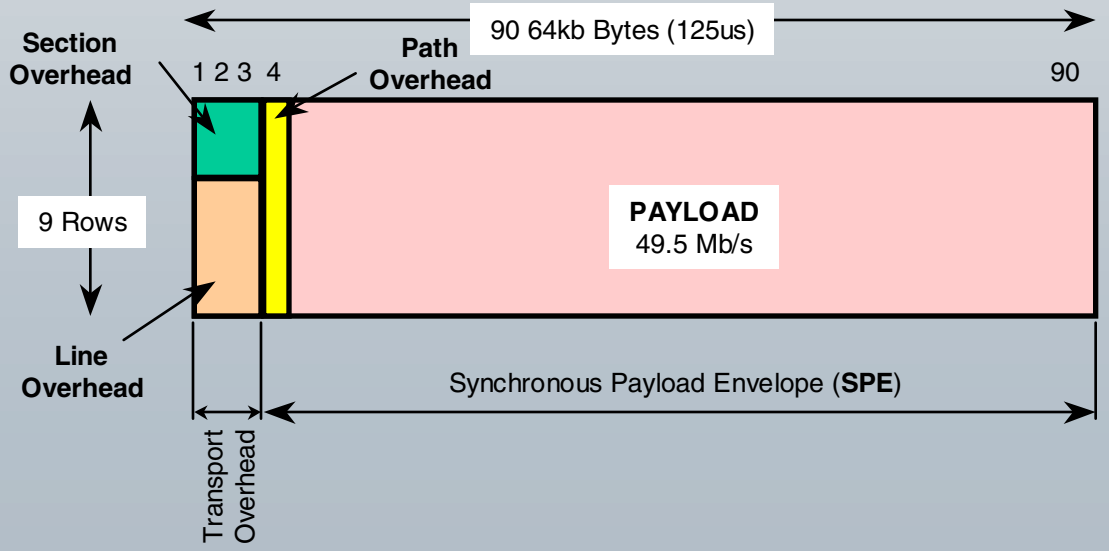
Applying standards to the Network Implementation

- ✓ SONET (Synchronous Optical Network)
  - ✓ Existing and new backbone implementations
  - ✓ Cheap and reliable
- ✓ ATM (Asynchronous transfer Mode)
  - ✓ Aggregation and concentration
  - ✓ Per circuit visibility
  - ✓ Maximize available bandwidth - very fine granularity
- ✓ PON
  - ✓ Optical access
  - ✓ Reliable - capable of fully redundant
  - ✓ Distributed backplane architecture - very efficient port usage over all reduced resource usage

SONET in Your Network

- ✓ Standards based
- ✓ Backbone technology
  - ✓ Scalable - OC- 3 (155 Mbps), OC- 12, (622 Mbps), OC- 48 (2. 4 Gbps)
  - ✓ Reliable - 50 msec automatic protection switching
  - ✓ Extensive performance and monitoring statistics
  - ✓ Point-to-point Oriented for path connections
  - ✓ Ring or linear deployments





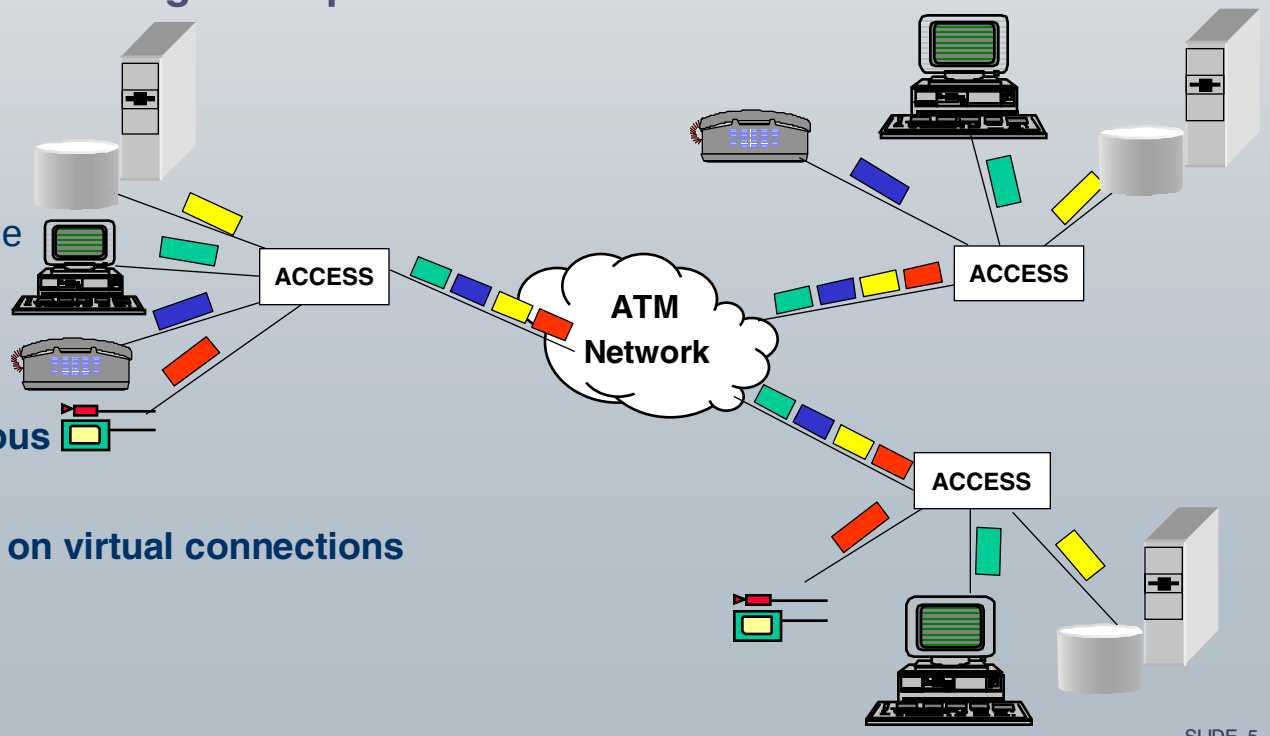
ATM in Your Network

BINDING ACCESS TO THE CORE

- ✓ Cell Technology
- ✓ Layer 2 technology - that is, rides on SONET or other Physical Layer
- ✓ 48 byte granularity
- ✓ Quality of service for guaranteed services (voice, TM, etc)
- ✓ Per circuit visibility - each circuit has own virtual circuit
- ✓ Multiple site aggregation and concentration
- ✓ Enables multiple services through encapsulation

Asynchronous Transfer Mode

- ⇒ Data transferred in cells
- ⇒ Cells flow asynchronously
- ⇒ Synchronous or asynchronous physical layer
- ⇒ Transferred through system on virtual connections



PON In your Network

PON is

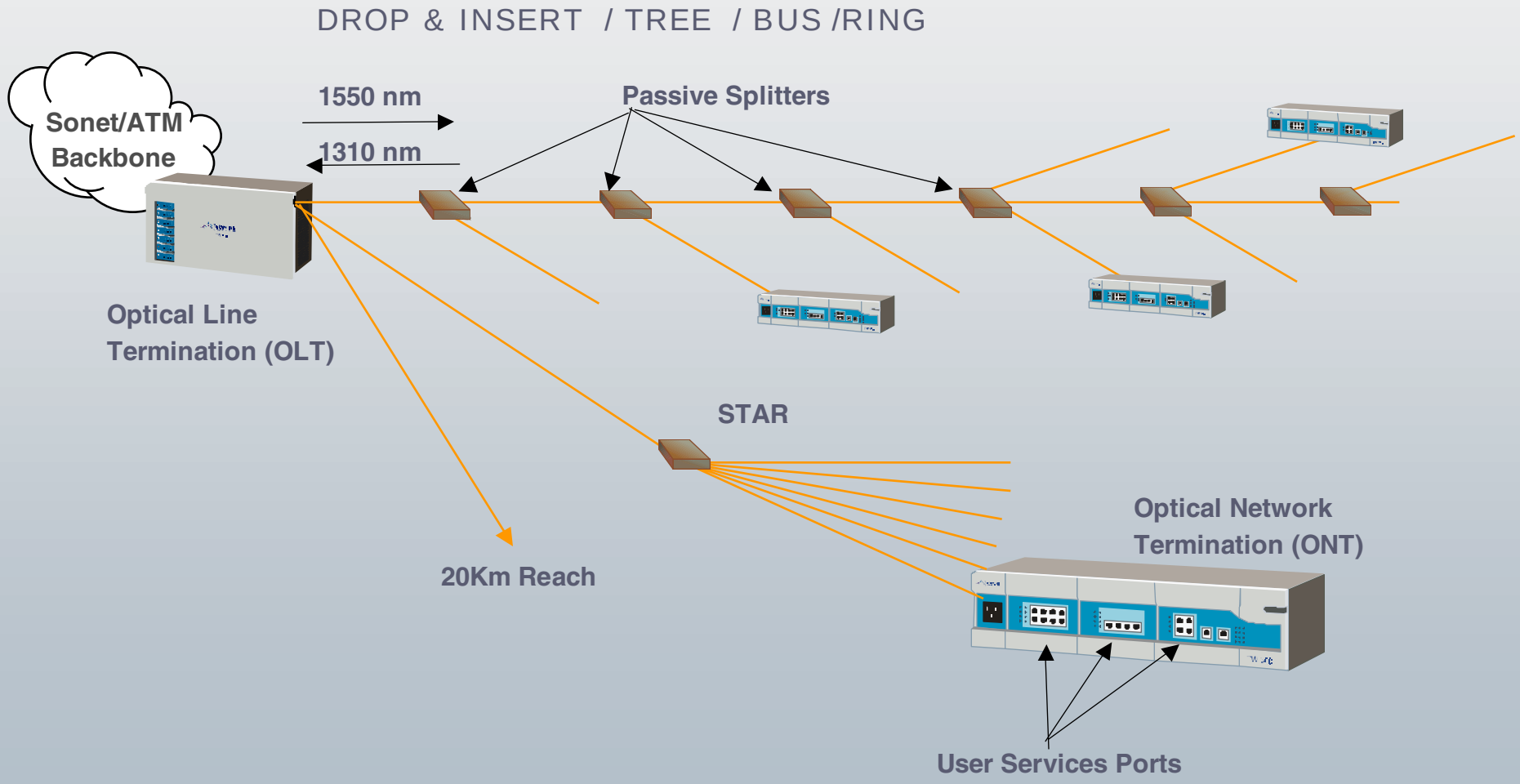
- ✓ **Optical Access Technology**
- ✓ **Standards based – FSAN compliant - G.983**
- ✓ **Reliable/ fully redundant capable**
- ✓ **Addition of sites/ modules through passive splitters**
- ✓ **Reduces SONET/ ATM ports**
- ✓ **Reduces remote power and environmental requirements**
- ✓ **Reduces fiber resource requirements - One fiber solution - WDM possible**
- ✓ **Distributed optical backplane**
- ✓ **Reduced resource usage (fiber and SONET/ ATM ports)**
- ✓ **Star, ring, or tree topology**

FSAN Started in June 1995

- ✓ **By group of global carriers to define fiber access - customer driven**
- ✓ **Fiber is only solution to required bandwidth**
- ✓ **Reduce SONET ports - lower cost**

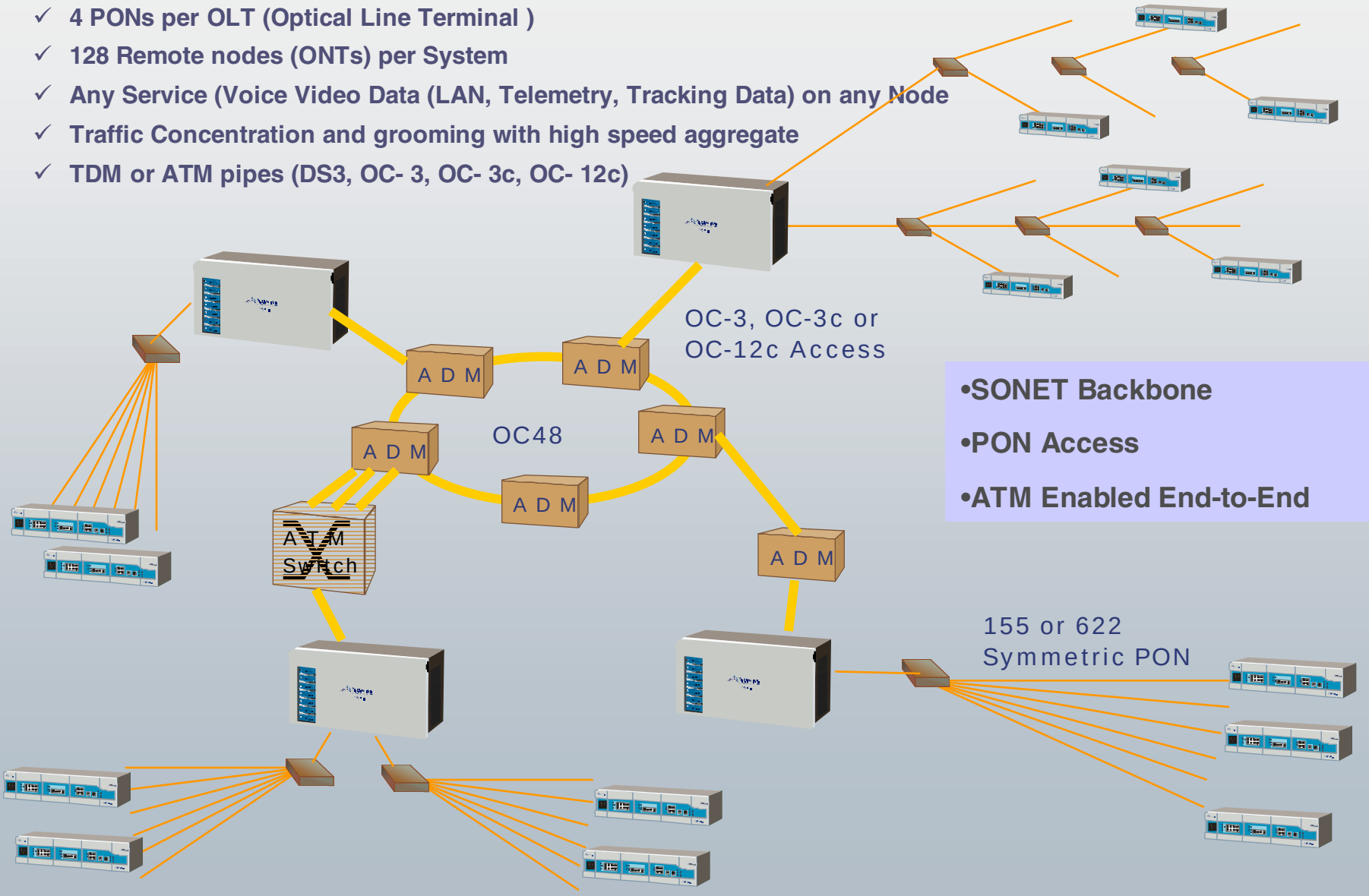
What is PON Technology

FSAN and G.983



System Model

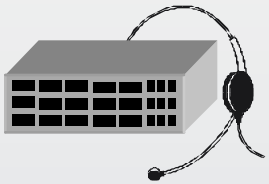
- ✓ 32 ONTs per PON (passive optical network)
- ✓ 4 PONs per OLT (Optical Line Terminal)
- ✓ 128 Remote nodes (ONTs) per System
- ✓ Any Service (Voice Video Data (LAN, Telemetry, Tracking Data) on any Node
- ✓ Traffic Concentration and grooming with high speed aggregate
- ✓ TDM or ATM pipes (DS3, OC- 3, OC- 3c, OC- 12c)



- •SONET Backbone
- •PON Access
- •ATM Enabled End-to-End

Services Required in the Range Network

- ✓ T1



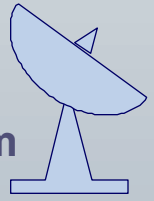
- ✓ TLS

LAN
10 / 100 TLS

- ✓ Video
  - ✓ MPEG - 2 (Programmable)
  - ✓ 2: 1 Lossless compression

VIDEO
NTSC
MPEG
LOSSLESS

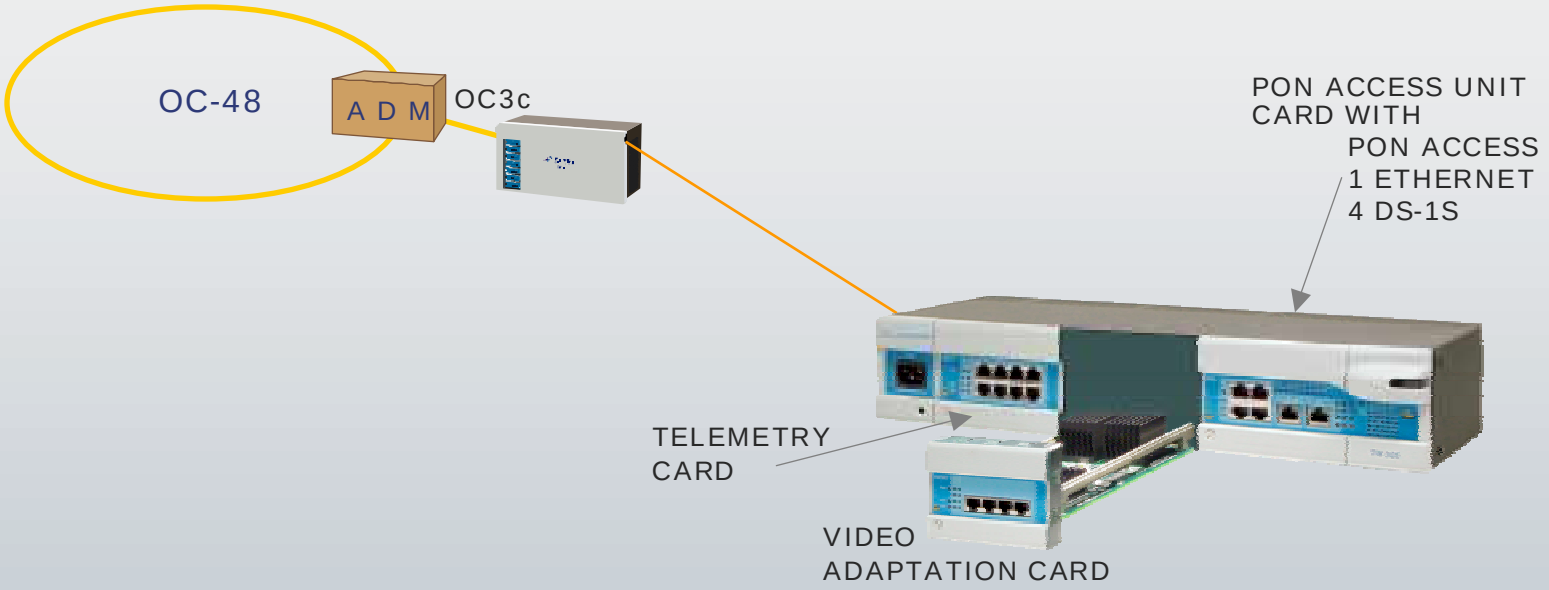
- ✓ Telemetry
  - ✓ Data rates to 52 Mbps
  - ✓ Wide Loop Bandwidth - Clock tracking algorithm



TELEMETRY
TTL
ECL
75B – 52Mb

- ✓ Supports per circuit encryption via KG- 75
- ✓ Interfaces DREN for inter- range support

Terawave ONT Service Modules

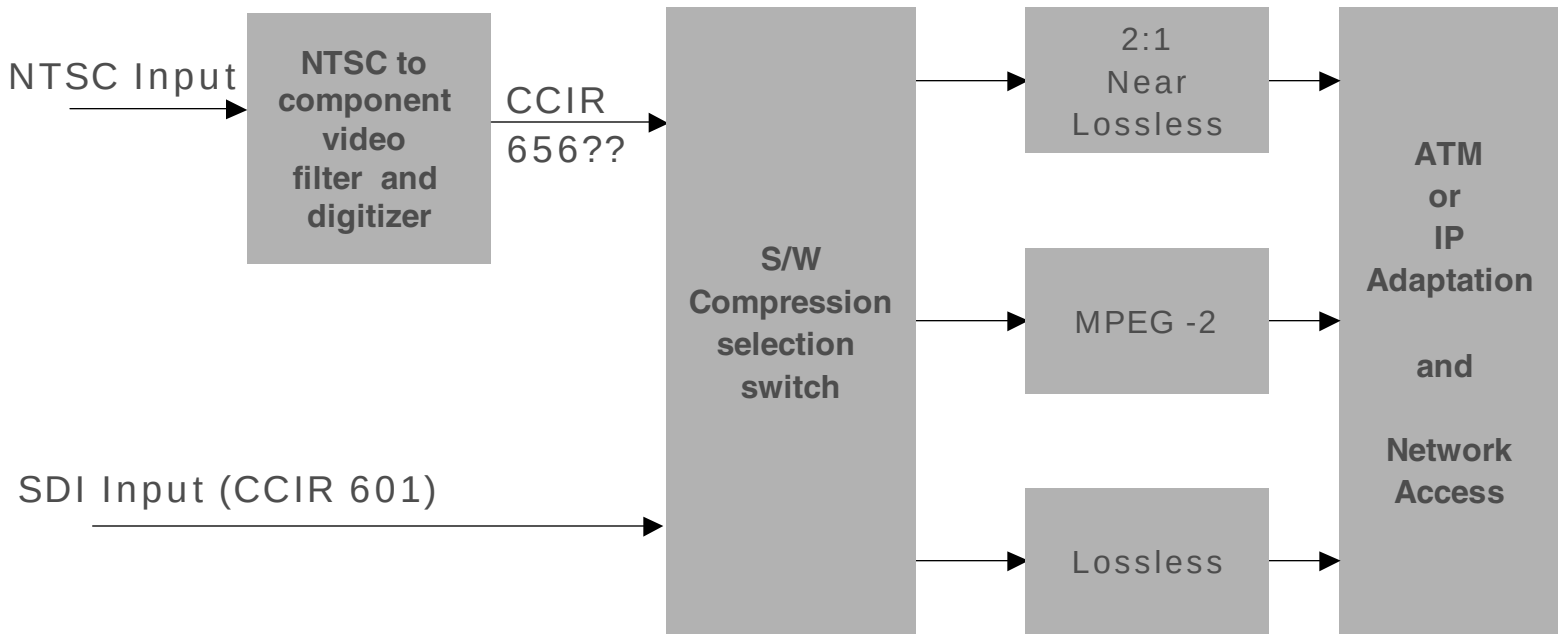


ONTs can be mission-optimized with standardized plug-and-play service modules for:

- ✓ **NTSC, MPEG-2, or Lossless Video (Up to 2 full duplex videos per ONT)**
- ✓ **High-Density Voice / Comm traffic (Up to 20 T1s per ONT)**
- ✓ **High Density LAN / TLS support (Up to 9 Ethernet ports per ONT)**
- ✓ **Telemetry (Up to 8 telemetry ports per ONT)**

Video Implementation

NTSC or SDI - MPEG-2 or Near Lossless

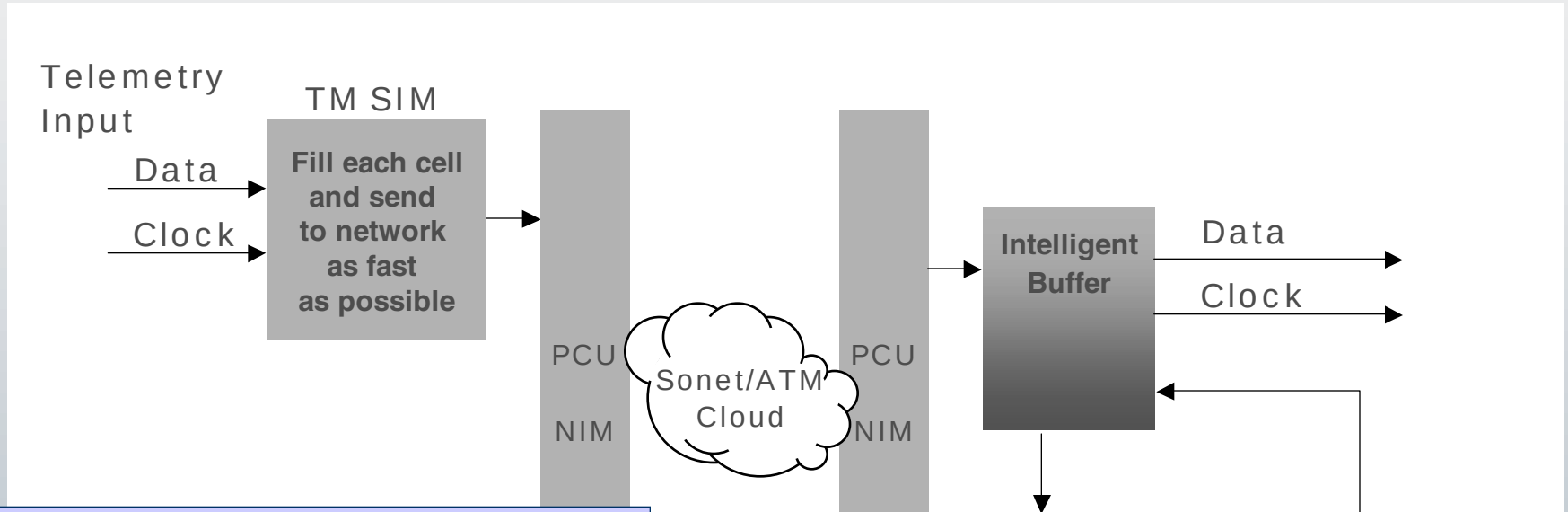


Video Subscriber Interface Module

(Encoder Side)

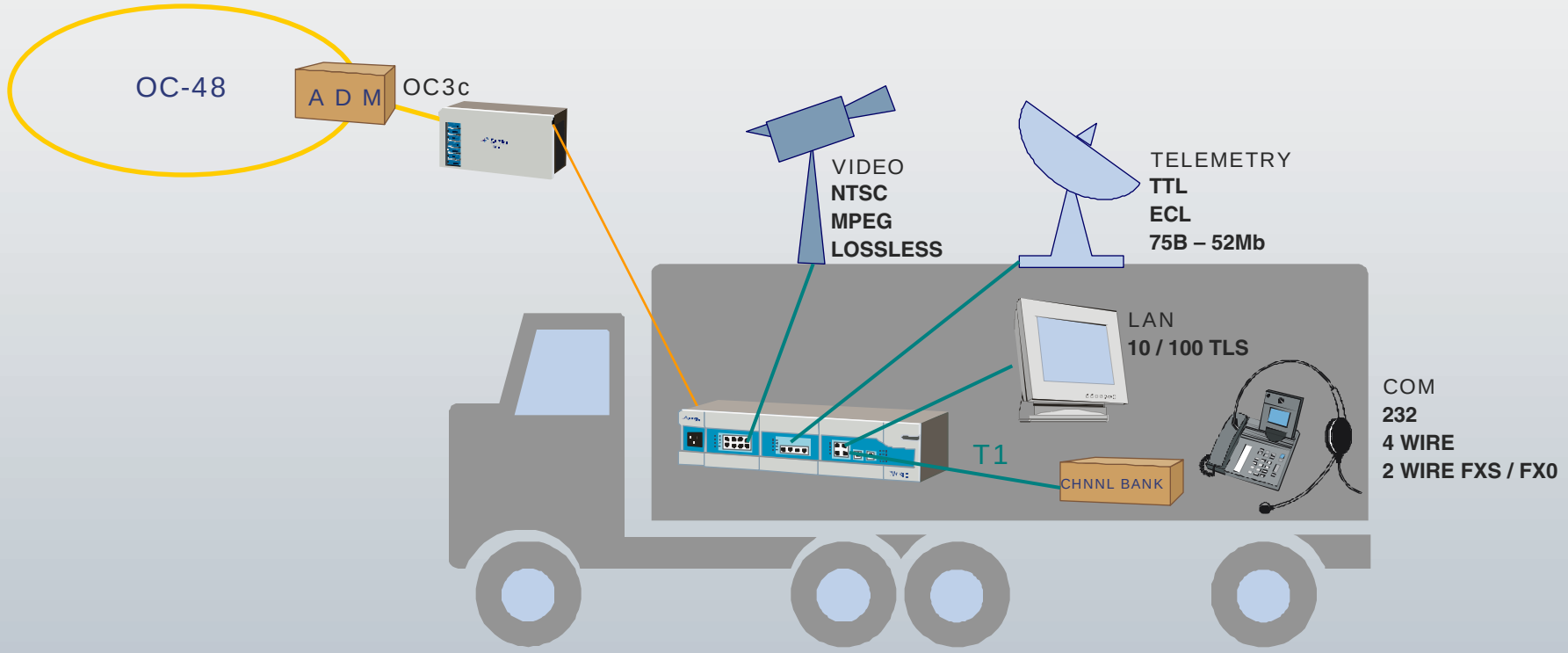
Telemetry Implementation

IRIG 106 compliant



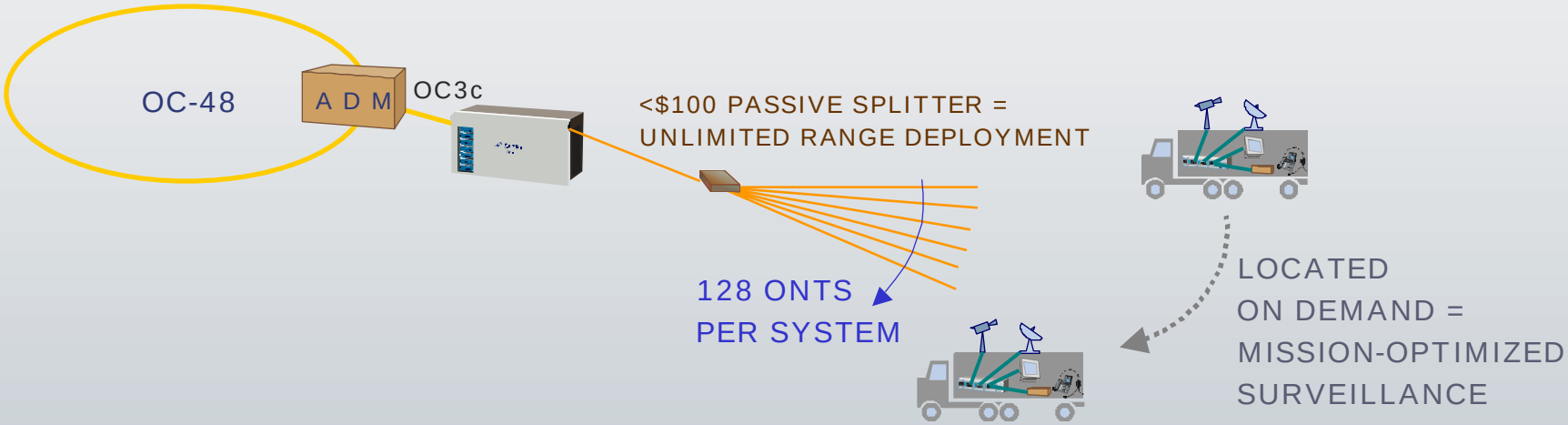
- Bit sycnch only required at input (direct output to crypto)
- Only one connection from input to output
- All clock recovery at output side
- 4 port bidirectional

Fixed or Mobile Site Application



- ✓ Integrated Broadband Services simplifies operations
- ✓ Common Platform accelerates training, simplifies inventory
- ✓ Protocol Adaptation concentrates traffic
- ✓ Traffic Aggregation eliminates stranded OC3 costs

Physical Reconfiguration Made Easy



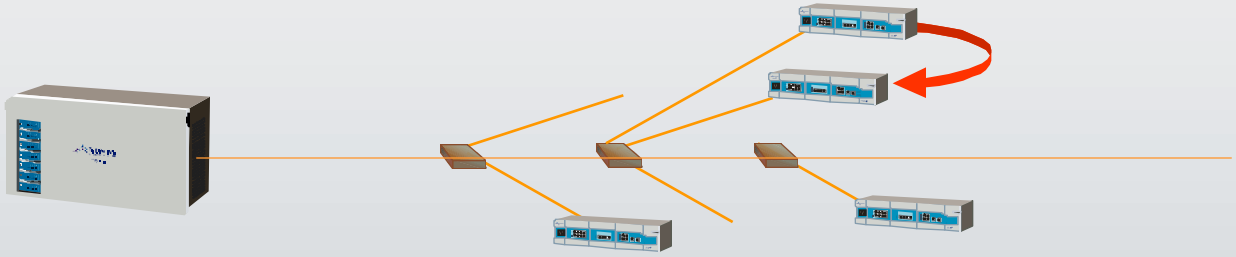
Supports Mobile Van environments

- ✓ **Auto discovery when attached at site**
- ✓ **Supports Mission to Mission Churn**
- ✓ **Allows Service Connection archival and restoration**
- ✓ **New Instrumentation sites may be added in future**
- ✓ **Supports Star, Bus, or Ring architectures, or any combination**

Reliability/Protection Schemes

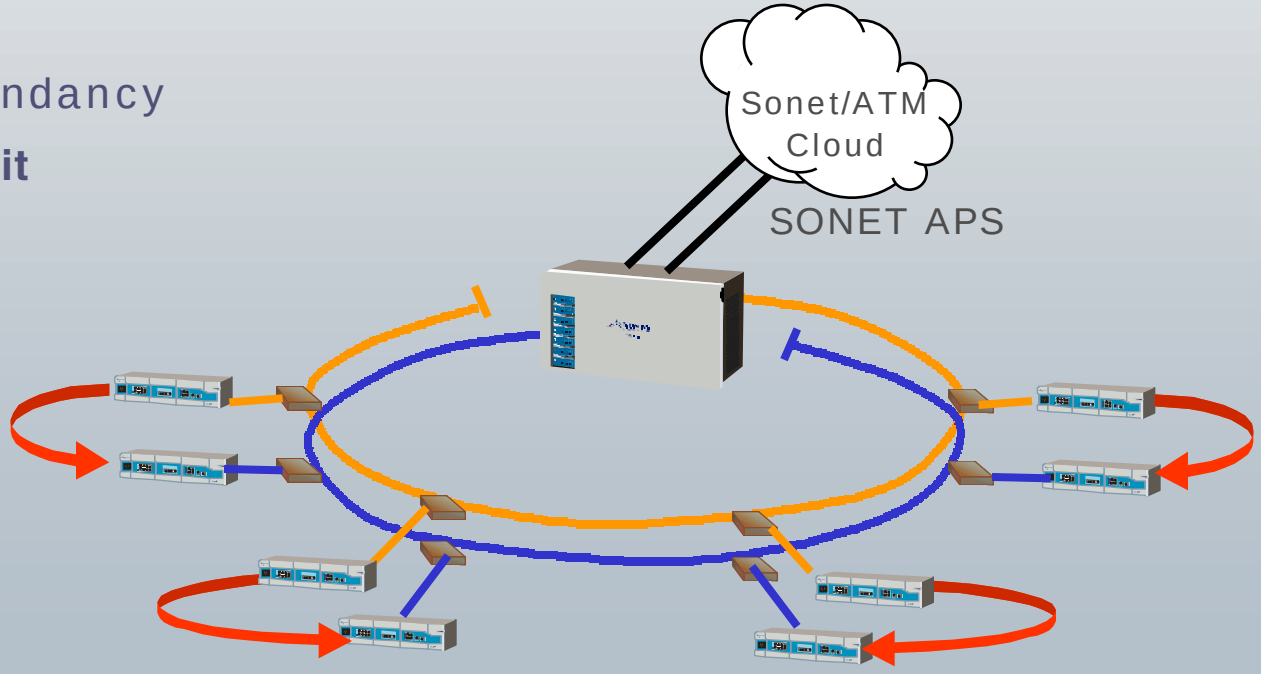
Selected Redundancy

- ✓**ONT**



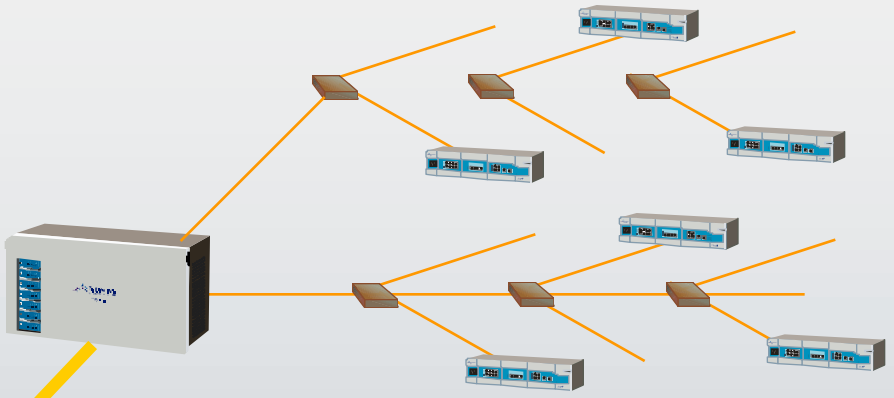
Complete Redundancy

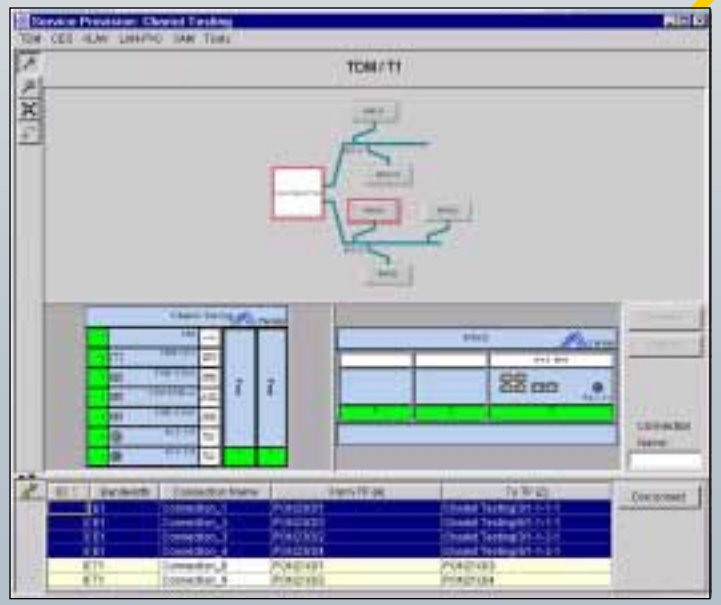
- ✓**PON Control Unit**
- ✓**ONT**
- ✓**Fiber**
- ✓**Power**

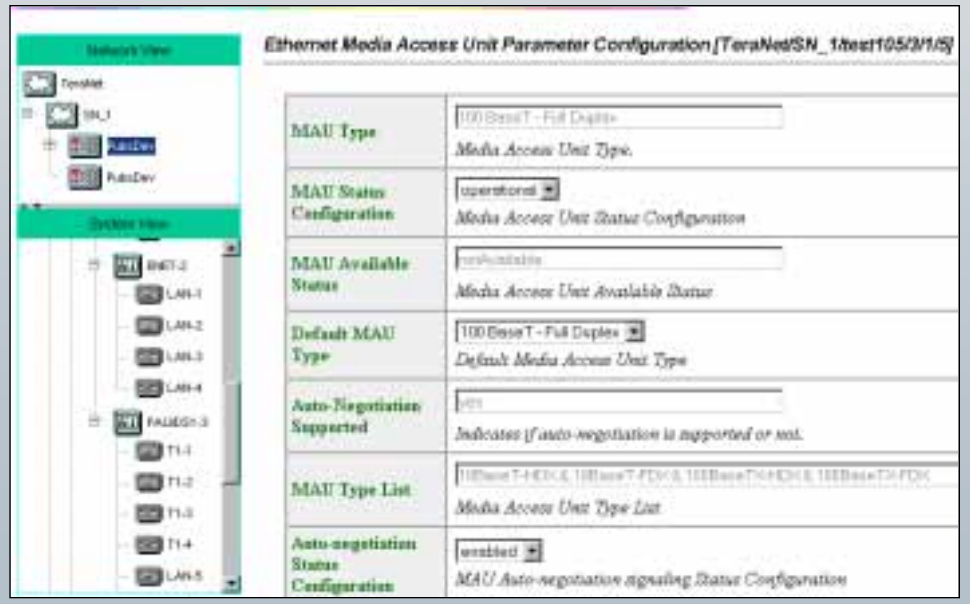


TeraPON Management System

- ✓ Enables Central Management
- ✓ Point and Click GUI
- ✓ Alarm Notification
- ✓ Performance Monitoring Statistics
- ✓ Remote Management Capability
- ✓ SNMP MIBS
- ✓ Northbound CORBA interface

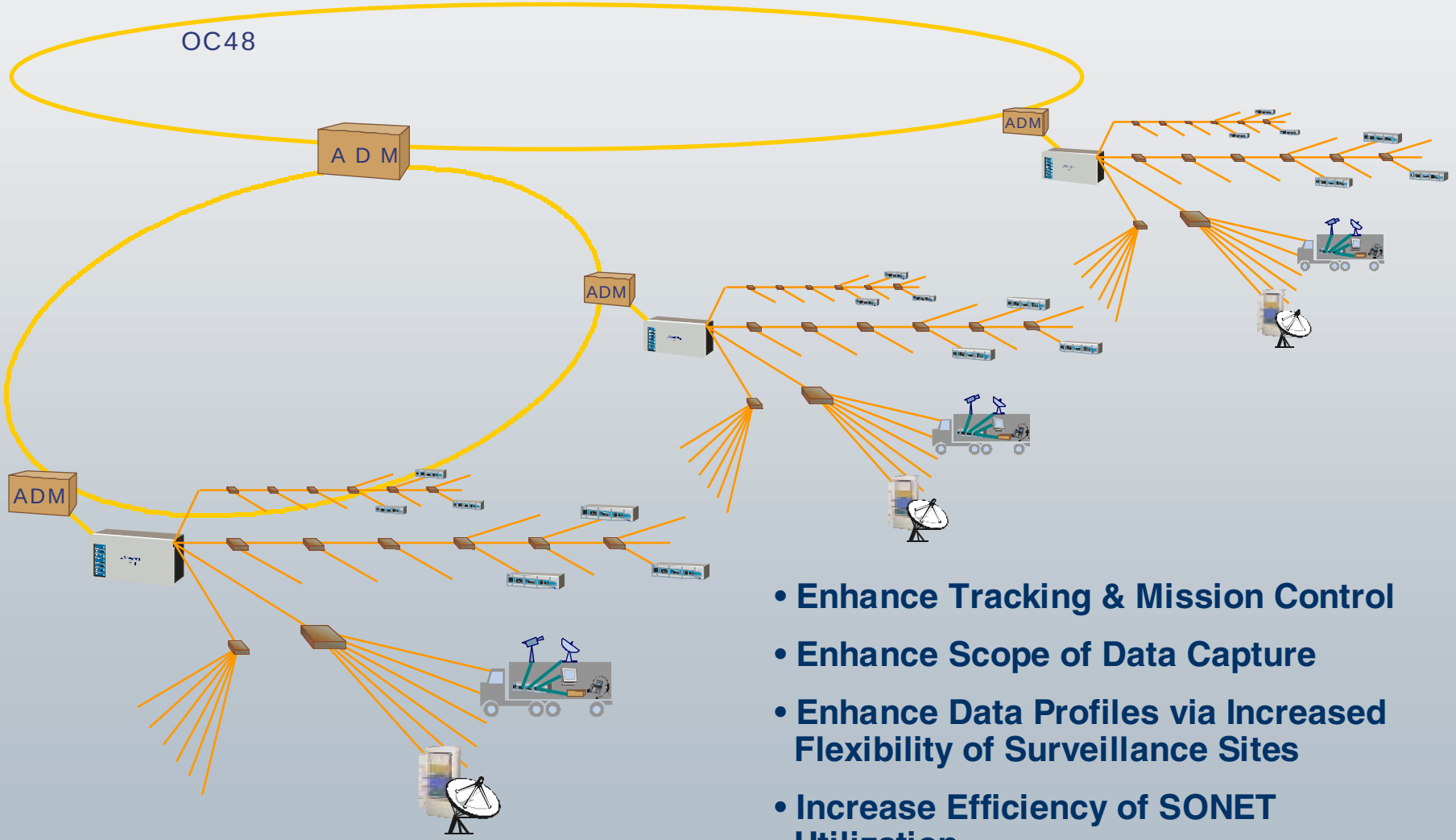






Expanding Network Coverage

LEVERAGING THE OC48 INVESTMENT TO EXTEND RANGE COVERAGE & INCREASE SURVEILLANCE QUALITY



- **Enhance Tracking & Mission Control**
- **Enhance Scope of Data Capture**
- **Enhance Data Profiles via Increased Flexibility of Surveillance Sites**
- **Increase Efficiency of SONET Utilization**

Summary

Standards in the network

- ✓ **SONET - Core/Backbone Technology**
- ✓ **PON - Access Technology**
- ✓ **ATM - Layer 2 Technology to Bridge Access and Backbone**

Terawave Delivers an Integrated Solution

- ✓ **Tailored Solution for Range Community**
- ✓ **Converged Services support for all range needs**
- ✓ **Reliability/ low latency/ Fully redundant**
- ✓ **Centralized Management**
- ✓ **Encryption and Inter- range circuit support - through standard ATM over SONET interfaces**

Benefits

- ✓ **Low Initial Cost and low incremental cost - modular ONTs**
- ✓ **Low operational Cost - Through Centralized Management**
- ✓ **Reduced error rate and simplified operations for mission churn - through remote access - fewer manula patches**